

## Original Research Article

# Assessment of the preferred restorative material – composite resin or ceramic – for anterior teeth restoration

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*Received for publication: July 31, 2018. Accepted for publication: November 20, 2018.*

### Keywords:

composite resin;  
ceramic; anterior teeth.

### Abstract

**Introduction and objective:** To evaluate the perception of clinicians and undergraduate students concerning their preferences and experience in using composite resin and ceramic veneers to restore anterior teeth restorations. **Material and methods:** 60 participants including clinicians (n=30) and undergraduate students (n=30) volunteered for this study. The study consisted of two parts. Firstly, the participant answered questions about their use and possible failure of ceramic or composite resin for anterior teeth. In the second part, participants analyzed 3 photographs of the anterior smile and reported on the presence of healthy teeth or restored teeth, with composite resin or ceramic veneers. **Results:** For both groups, composite resin was frequently used over ceramic and the most important reported factor in this decision choice was the cost factor. Both groups presented a failure percentage higher than 50% for composite resin, and this percentage was higher for undergraduate students. In the visual analysis of the photographs, none of the participants identified all the restorations correctly. **Conclusion:** Composite resin is the most common material of choice for clinicians and undergraduate students. Distinguishing natural teeth from restored teeth has become increasingly difficult, despite the restorative material (composite resin or ceramic) used.

## Introduction

The treatment of anterior teeth has always presented itself a challenge in reconstructive dentistry [5]. Clinicians aim to obtain excellent esthetic results and preserving the biological structures involved as much as possible. With the advancement of dental materials, the many restorative options such as composite resins, all-ceramic crowns, and ceramic veneers are presently available [2, 6, 15].

Due to the variety of treatment materials and methods available, including ceramics and composite resins, clinicians need to consider the advantages and disadvantages in order to choose the best material for their patients. Composite resins are more consistent with the concept of minimally invasive dentistry compared to ceramic veneers. They are relatively easy to use, they lower clinical time without a laboratory step, and they are also cost-effective [1, 13, 16]. Some disadvantages of composite resins include their color instability, inherent polymerization shrinkage, increased water sorption which can lead to a decrease in wear resistance, and they can also cause post-operative hypersensitivity [1, 10].

Indirect restorative ceramic veneers have improved strength characteristics along with desirable optical properties that make them ideal for the fabrication of esthetic veneers. They also have excellent esthetic value, good chemical stability, adapt well in the marginal area, and they have good wear resistance. However, using ceramic veneers require the tooth to be prepared, which is potentially destructive to an otherwise healthy tooth structure [4, 9, 11].

The objective of this study is to evaluate the perception of clinicians and undergraduate students concerning their preferences and experience in using composite resin and ceramic veneers to restore anterior teeth restorations.

## Material and methods

This study was approved by the Human Research Ethics Committee of the Federal University of Santa Catarina (approval number: 950.253/2014). All the participants signed a consent form.

Data were recorded from 60 randomly selected participants which included clinicians (n=30) of the city of Florianopolis, SC, Brazil and undergraduate students (n=30) in their final year of the School of Dentistry of the Federal University of Santa Catarina, Florianopolis, SC, Brazil. The study consisted of two steps, firstly a questionnaire was given for the participants to answer and then the participants were asked to visually analyze some photographs.

In the first step, the participants were asked to objectively answer the following questions; 1) how often would you use composite resin and/or ceramic veneers? 2) What criteria do you use when choosing the material? 3) Have you had failures in your anterior restorations? If yes, what was the reason? 4) What are the success rates for 2 to 5 years post treatment?

In the second step, the participants were positioned at a distance of 50 cm from the photograph and were given 2 minutes for observation and analysis. After 2 minutes, the participant was shown the next photograph and was not allowed to return to the previous one. Three photographs were evaluated regarding each tooth and the harmony of the anterior smile (from canine to canine) as shown in figures 1, 2 and 3. Each participant recorded if they could identify the natural teeth, teeth restored partially or fully on the labial surface with composite resin, and/or full ceramic veneers. The data was collated and statistically analyzed using descriptive statistical measures.

The first image as shown in figure 1 was of a partial restoration on the mesial edge to close the diastema in the central incisors using composite resin (B1, Impress Direct, Ivoclar Vivadent), with lateral incisors restored with ceramic veneers (IPS e.max CAD, Ivoclar Vivadent). The second image as shown in figure 2 was all healthy teeth. The third image as shown in figure 3 was of a partial restoration on the distal edge of the central incisors using enamel composite resin (B1, Impress Direct, Ivoclar Vivadent), and on the distal edge of the lateral incisors using enamel and dentin composite resin (B1, Impress Direct, Ivoclar Vivadent). All photos were taken one year after the restoration was placed.



**Figure 1** - First photograph assessed by the participants. Partial restoration on the mesial edge to close the diastema in the central incisors using composite resin (B1, Impress Direct, Ivoclar Vivadent), with lateral incisors restored with ceramic veneers (IPS e.max CAD, Ivoclar Vivadent)



**Figure 2** – Second photograph assessed by the participants. All healthy teeth



**Figure 3** – Third photograph assessed by the participants. Partial restoration on the distal edge of the central incisors using enamel composite resin (B1, Impress Direct, Ivoclar Vivadent), and on the distal edge of the lateral incisors using enamel and dentin composite resin (B1, Impress Direct, Ivoclar Vivadent)

**Table I** – Number and mean percentage of using ceramic and composite resin in anterior teeth restorations by clinicians and undergraduate students

Frequency	Composite resin		Ceramic	
	N	%	N	%
0%	0	0	19	63
10% a 30%	0	0	8	27
30% a 50%	1	3	2	7
50% a 70%	2	7	1	3
70% a 90%	12	40	0	0
100%	15	50	0	0
Total	30	100	30	100

Note: results based on the number of participants

**Table II** – Number and mean frequency of using ceramic and composite resin in anterior teeth restorations by clinicians, divided into specialists and post-graduate students

Frequency	Composite resin		Ceramic	
	N	%	N	%
0%	0	0	2	7
10% a 30%	0	0	17	57
30% a 50%	4	13	8	27
50% a 70%	8	27	2	7
70% a 90%	16	53	1	3
100%	2	7	0	0
Total	30	100	30	100

Note: results based on the number of participants

## Results

Regarding the restorative material used, both clinicians and undergraduate students reported they used composite resin more often than ceramic. Between the groups, the frequency of use among the undergraduate students was higher than the clinicians (tables I and II).

All participants responded that their main reason in deciding which material to use was the cost. Following this, the undergraduate students reported their choice was based on the executing technique and the esthetic result. On the other hand, clinicians regarded the age of the patient and the longevity were considerations affecting their

choice, whereas these factors were less relevant for the undergraduate students.

With regard to the success rates of the composite resin restorations, 33% of undergraduate students reported 100% success, but only 13% of clinicians reported a 100% success. Concerning the use of ceramics, clinicians reported a higher number of restorations with this material than the number reported by the undergraduate students. For 73% of the clinician placed ceramic restorations; there was a reported range of 70% to 90% success compared to a 46% success for the undergraduate students. Although the number of undergraduate students who used ceramic was lower than the clinicians, 45% reported a 100% success rate in performed restorations, compared to only 23% of the clinicians.

With regard to the failure of the restorations with composite resin, the undergraduate students reported a lower percentage had failed when compared to the failure reported by clinicians (23% and 93%, respectively). The most common reported reasons of failure for undergraduate students and clinicians were: teeth with color alterations (43% for undergraduates and 31% for clinicians), anterior rehabilitation with composite resin (43% for undergraduates and 26% for clinicians), class V (0% for undergraduates and 39% for clinicians), and diastema closure (14% for undergraduates and 3% for clinicians).

In the visual analysis part of the study, all participants reported the esthetical outcome in all three photographs as "similar to natural teeth". When questioned about each tooth individually, none of the participants were able to answer all the three situations correctly.

In the first photograph (figure 1) with a diastema in the central incisors restored with composite resin and lateral incisors with ceramic veneers, the success percentage of the treatments was less than 23% for the undergraduate students and less than 40% for the clinicians. In the second photograph (figure 2), in which all teeth were healthy, the success percentage ranged from 33% to 90% for the undergraduate students and 30% to 90% for the clinicians. In photograph three (figure 3), with central and lateral incisors distal restored with composite resin, the success percentage for the clinical situation was less than 23% for the undergraduate students and less than 33% for the clinicians.

## Discussion

When comparing between clinicians and undergraduate students, ceramic was used more

often by clinicians. This could be explained by clinicians having a longer clinical time and clinical experience. This relation is also in accordance with Chimentão *et al.* [3], who reported on the tendency of using composite resin and ceramic. They looked at 173 anterior restorations, 166 were performed with ceramic but only 7 with composite resin. This showed a higher frequency of the use of ceramic, when compared to composite resin.

Regarding the success rates of the restorations for a period of 2 to 5 years, the undergraduate students reported higher success rates than the clinicians for the restorations with composite resin. However, this finding may be related to a lower follow-up of the cases by the undergraduate students. Krämer *et al.* [8] reported good longevity of composite resin restorations after 4 years. Kim *et al.* [7] conducted a study to assess the clinical performance composite resin for 5 to 10 years and observed that the longevity of the direct restorations ranged from 9.7 to 11 years.

With regard to the failure of the restorations, keeping in mind that the longevity period was not considered and the higher clinical experience of the clinicians over the undergraduate students, besides the longer follow-up period of the accomplished cases, the major point of failure by both groups was color alteration. This was followed by the fragmenting of the material and fracture in the incisor margin. Opdam *et al.* [12] observed that the main cause of failure was secondary caries, followed by restoration fracture. The color alteration could be explained by composite resin water sorption. The fractures are often related with the size and location of the restoration, oftentimes due to chewing tension and lateral and protrusion movements without inadequate occlusal adjustment [16].

Ceramic was the material that showed higher success rates in the restorations regardless if they were from clinicians or undergraduate students. It should be noted that the use of ceramic was lower than composite resin, and this may have affected the results. According to a literature review [15], the success of ceramic restorations after 5 years range from 70% to 100%, and for laminate veneers this rate ranged from 83% to 100%, corroborating the results of the present study.

Concerning the perception of clinicians and undergraduate students of the treatment outcomes, through a visual analysis of the photographs, it was observed that there was difficulty differentiating the ceramic from composite resin and natural teeth, as well as identifying the type and location of the restoration (no similar methodology was found in the literature).

In figure 1, associating between ceramic and composite resin, 33% to 40% of the interviewed said that the maxillary central incisors had ceramic veneers and 30% to 50% said the maxillary lateral incisors were healthy. In figure 2, with only healthy teeth, both clinicians and undergraduate students pointed the presence of ceramic veneers and composite resin restorations. This demonstrates that the use of these materials combined in the esthetic zone is appropriate and the perception of the difference is very difficult to identify [14]. This can be attributed to the improvements and advancement of the materials, having good esthetic outcomes with both materials.

## Conclusion

Composite resin and ceramic veneers are excellent esthetical restorations for natural teeth. This shows the advancement of dental materials in restoring teeth in the esthetic region. Although both materials are used frequently, composite resin is the preferred material of choice due to their low costs, ease of use, and desirable esthetic outcomes.

## Acknowledgments

This study was supported by the Federal University of Santa Catarina.

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